

Review Article

Self-management approaches for diabetic patients in the context of digital healthcare: a concept analysis

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ABSTRACT

Effective self-management is central to diabetes care, improving glycaemic control and patient outcome. The rapid growth of digital health—defined as the use of information and communication technologies (mobile apps, wearables, telemedicine, etc.) to manage illness and promote wellness—offers new tools for diabetes self-care. To clarify the concept of self-management approaches for diabetic patients in the context of digital healthcare using Walker and Avant's eight-step method of concept analysis. Authors conducted a structured concept analysis. A comprehensive search of the literature (PubMed, CINAHL, MEDLINE and Google Scholar) was performed for terms related to "diabetes self-management", "digital health" and "eHealth interventions". Seminal works and definitions were consulted. Walker and Avant's framework guided the analysis steps used. The concept is defined as the use of digital technologies by patients with diabetes to actively monitor, make decisions about and carry out health-related behaviors in managing their condition. Defining attributes were identified. Patient engagement and empowerment—active participation in care and confidence in self-care decisions. Data-informed decision-making—systematic self-monitoring (e.g., glucose, activity) with actionable feedback. Use of technology—integration of digital tools (apps, wearable sensors, telemedicine) to support self-care. Personalized and goal-directed actions—individualized goal setting (diet, exercise, medication adherence) and tailored education. Connectivity and support—ongoing communication with healthcare providers or peer networks via digital platforms. Self-management in the digital era for diabetes encompasses active, tech-enabled patient behaviors guided by data and support.

Keywords: Concept analysis, Diabetes mellitus, Digital health, eHealth, Patient engagement, Self-care, Telemedicine

INTRODUCTION

Diabetes mellitus is a chronic condition whose management critically depends on patients' daily self-care. Effective self-management defined as the patient's active participation in monitoring glucose, adhering to diet/exercise regimens and problem-solving in daily care is known to improve glycemic control and reduce complications. The American Diabetes Association emphasizes that self-care behaviors (healthy eating, physical activity, medication adherence, glucose monitoring, risk reduction and coping skills) are essential components of diabetes management.¹ Self-management education and support programs help patients integrate these behaviors into their lives.

In recent years, the expansion of digital health (also termed digital healthcare or eHealth) is transforming how chronic diseases are managed. Digital health involves the use of information and communication technologies such as mobile health (mHealth) apps, wearable sensors, telemedicine/telehealth platforms and online decision-support to manage health and promote wellness.² These technologies can improve access to care, personalize interventions and provide real-time feedback.

For diabetes, digital tools range from smartphone applications for blood glucose logging, to connected glucose meters, to web-based education and tele-coaching programs. For example, digital interventions have been shown in meta-analysis to reduce hemoglobin A1c by 0.3–0.5% in type 2 diabetes, indicating improved clinical outcomes. Kerr et al, reported that digital self-management programs are “feasible, effective and acceptable” for reducing HbA1c in adults with type 2 diabetes. Furthermore, the COVID-19 pandemic has accelerated adoption of telehealth and online care, highlighting the importance of patient self-management using technology.³

Due to the increased levels of health anxiety in relation to the progression of Disease, health care professional must be aware towards concern.⁴ However, diabetes patient must increase its compliance to the plan of care that the nurse will create for them. Establishing strong relationship will provide opportunity in the delivery of care. Although electronic consultation as one means to reach the people, engagement and evaluation must assess thoroughly the effectivity of. Online consultation towards definitive result. Integrated risk assessment and management strategies have been shown to improve self-management. Using of concept plotting has been attributed to the improvement of critical thinking in promoting, organizing and preparing complex information expansively.^{3,4}

Even country where they belong to first world has challenges in the accessibility making remote consultations and telehealth like socioeconomic inequality is associated with digital poverty, poor access

to technologies and poor digital literacy.⁵ The disruption of public health measure has restricted the access of diabetes care limiting to self-management that require in reducing their risk of diabetes complications.⁶ Psychological problems (anxiety, diabetes distress and depression) and hyperglycemia has been reported as major concern. Nurses who rated the effect of the pandemic as having an extreme negative impact on diabetes care in general and in respect of self-management support, diabetes education, technical care and psychological care. diabetes nurses who worked exclusively with people who have type 2 diabetes tended to rate the physical impact of the disease more highly.^{4,6}

Despite this growth, the concept of a self-management approach within the digital healthcare context remains broad and ill-defined. Researchers and clinicians use overlapping terms (digital self-management, telehealth interventions, mHealth support, etc.), but the essential characteristics are not clearly delineated. Without conceptual clarity, it is difficult to design appropriate interventions or to measure their key components.⁷ Concept analysis, a method from nursing theory, can help clarify such complex concepts.^{5,6} Applying Walker and Avant's eight-step method provides a structured way to define attributes, antecedents, consequences and referents of a concept.^{8,9} Notably, Othman et al, conducted a concept analysis of diabetes self-management education and identified key attributes such as decision-making, problem-solving, action-taking, patient-provider interaction and resource utilization.¹ We build on this work by focusing explicitly on self-management approaches in digital healthcare for diabetes.

Aim

The aim of this study is to analyze and clarify the concept of “self-management approaches for diabetic patients in the context of digital healthcare.” By systematically identifying its defining attributes, antecedents, consequences and empirical referents, we intend to provide a precise conceptual foundation. This clarity will aid future research (for example, creating measurement tools and theoretical models) and guide clinical practice in designing digital self-management support. The analysis follows the IMRaD format required by BMJ open diabetes research and care and uses an academic, peer-reviewed tone.

METHODS

This concept analysis employed Walker and Avant's eight-step methodology as a framework.¹⁰ The steps included selection of the concept (“digital diabetes self-management approach”), determination of the analysis purpose, identification of concept uses, delineation of defining attributes, construction of a model case, construction of additional cases (borderline/related and contrary), identification of antecedents and consequences and specification of empirical referents. Authors reported

the process and findings under these steps in alignment with the standards for reporting qualitative research (SRQR) to ensure transparency.

Data sources

To identify uses of the concept and relevant literature, we conducted a broad search for terms including “diabetes self-management”, “self-care AND diabetes AND digital”, “telehealth AND diabetes” and “mHealth AND diabetes self-care” in PubMed, MEDLINE, CINAHL and Google Scholar (English language, 2000–2025). We also consulted grey literature (clinical guidelines, reputable health websites) and concept analysis studies (e.g., Othman et al, on DSME). Relevant data were extracted to capture definitions, descriptions, synonyms and examples of digital self-management.

Data analysis

Notes and quotations from each source were collated. Repeated characteristics and phrases were identified to determine common elements (attributes) of the concept. Categories such as antecedents (conditions preceding the concept) and consequences (outcomes following the concept) were noted. To ensure rigor, two authors independently reviewed the literature findings and reached consensus on themes. Model and contrary cases were constructed based on these attributes (model case containing all attributes, contrary lacking them). Finally, we identified empirical referents measurable indicators corresponding to the attributes.

RESULTS

Concept definition and uses

In examining literature and practice, we define “self-management approaches in digital healthcare for diabetic patients” as patient-led processes of managing diabetes that are enabled and supported by digital tools and technologies. In practical terms, this includes use of smartphone apps, online programs, wearable monitors, teleconsultations or similar technologies to facilitate daily self-care tasks. The concept encompasses both the approaches (strategies, processes) and the means (digital context) of self-management.^{11,12}

This concept is closely related to others like “eHealth self-care”, “digital health coaching” and “telehealth-assisted self-management”, but we focus on the patient-centered approach aspect. Literature on digital interventions often describes components: for example, mobile apps for logging and reminders, online education or remote coaching to empower self-care. Alaslwi et al note that “mobile apps for diabetes self-management can enhance patients’ self-management activities” if effectively adopted.³ Importantly, concept analysis requires isolating what makes this concept unique. We emphasize that it is not simply having diabetes or using

any tech; it is the purposeful integration of digital means to actively engage patients in self-care.⁵

Defining Attributes

Through synthesis of sources and logical analysis, we identified the following core attributes (essential characteristics) of the concept. Each attribute must be present for an approach to qualify as a digital self-management approach for diabetes.⁸

Active patient engagement and empowerment

The patient is an active participant, not a passive recipient. They take initiative in their care, set goals and exercise control. This includes skills like decision-making and problem-solving regarding one’s diabetes management (e.g., adjusting diet when glucose is high). Othman et al, similarly identify decision-making, problem-solving and taking action as fundamental to diabetes self-management. Empowerment implies confidence and self-efficacy in handling one’s condition. A digital self-management approach is characterized by a motivated patient who uses technology to reinforce self-efficacy.

Use of digital technology

The approach explicitly involves digital tools as an integral part of self-management. This may include smartphone or web applications, wearable glucose or activity monitors, cloud-based patient portals, telehealth visits or SMS messaging. Merely being health-literate is not enough, the approach leverages information and communication technologies to enhance self-care. This digital integration distinguishes it from traditional self-care. For example, use of a connected blood glucose meter that syncs with an app or a video-consult with a diabetes educator are indicative of this attribute.¹³

Data-informed decision-making

The approach relies on the collection and utilization of health data by the patient (and possibly providers). Patients regularly monitor and record relevant metrics (blood glucose readings, carbohydrate intake, exercise) in digital platforms. They receive feedback (e.g., trend graphs, automated alerts or coach input) that informs their decisions.^{13,14} This closes the loop between action and information: patients learn from their data and adjust their behavior (e.g., modifying insulin dose or increasing activity) accordingly. Thus, systematic self-monitoring and feedback integration is a defining feature.^{8,9,15}

Personalization and goal-directed actions

The self-management is tailored to the individual. Digital tools often allow setting personalized goals (weight targets, step counts, glycemic targets). Education content and advice can be individualized (for example, adapting

to the patient's literacy level, culture or comorbidities). The patient works towards specific self-set or coach-set goals (healthy eating, exercise plan adherence, medication adherence). This attribute includes making and following through on lifestyle changes and medical regimens. It extends beyond generic instructions to focused, patient-specific action.

Continuous communication and support

There is an element of connection with healthcare providers or peer support networks, facilitated by technology. The digital approach provides channels (secure messaging, teleconsultation, online communities) for ongoing support, guidance and accountability. Unlike self-management in isolation, the digital context often involves interactions for instance, receiving remote coaching from a diabetes educator or sharing progress in an online support group. This collaborative dimension helps sustain the patient's efforts.^{9,15,19}

These attributes are interrelated. For example, an empowered patient (first attribute) uses an app (second attribute) to enter glucose data and the app provides feedback (third attribute) which helps them follow a personalized plan (fourth) and communicate with a nurse (fifth).

DEFINING ATTRIBUTES OF SELF-MANAGEMENT APPROACHES IN DIGITAL HEALTHCARE FOR DIABETES

Patient engagement/empowerment

Active participation, initiative and confidence in self-care tasks.

Use of digital technology

Integration of ICT tools (apps, devices, telehealth) into management.

Data-informed decisions

Regular self-monitoring and use of feedback/data to guide actions.

Personalization/goal orientation

Individualized goals and tailored strategies in daily management.

Connectivity and support

Ongoing digital communication with providers/peers for guidance.

MODEL CASE (ILLUSTRATIVE EXAMPLE)

Consider the following scenario as a model case, which embodies all defining attributes of the concept.

Case

Mr. A is a 58-years-old man with type 2 diabetes. After attending a diabetes education program, he begins using a smartphone app that syncs with his Bluetooth-enabled glucometer and fitness tracker. Every morning, he measures his blood glucose and logs meals in the app. The app displays his glucose trends over time and reminds him to take medications and exercise. Using these data, Mr. A makes informed decisions: if his morning glucose is high, he chooses a lighter breakfast and walks 30 extra minutes. He sets personal goals (e.g., keeping fasting glucose under 110 mg/dl) and the app notifies him of progress. Through the app's messaging function, he communicates weekly with a diabetes nurse, who reviews his logged data and gives positive feedback or advice via chat. Mr. A also watches tailored educational videos in the app about healthy eating. Because of this digital program, Mr. A feels more in control of his condition and actively adjusts his lifestyle. Over time his HbA1c improves and his provider notes better management. This model case clearly demonstrates the concept. Mr. A is actively engaged and empowered (he uses data to adjust behaviors), he uses digital technology (app, devices, tele-counseling), he relies on data-informed decisions (glucose logs and feedback), he follows personalized goals and he maintains digital support with his nurse. All attributes are present.¹²⁻¹⁴

CONTRARY CASE (NEGATIVE EXAMPLE)

In contrast, a contrary case lacks the defining attributes of the concept.

Case

Ms. B is a 65-years-old woman with type 2 diabetes who received only occasional dietary advice and free glucometer at diagnosis. She does not use any digital tools or apps. Ms. B checks her blood sugar sporadically and does not track or record it. She does not seek education or support beyond the clinic visits every six months. She adheres to medications unevenly and makes no active changes based on her readings (often ignoring highs and lows). She has not set any goals and does not communicate with healthcare providers outside of appointments. Ms. B's HbA1c remains elevated. This case illustrates absence of the concept: there is no use of digital technology, no systematic data collection, no active engagement or problem-solving, no personalized goals and minimal support. Ms. B's approach is passive and unstructured, the opposite of a self-management approach in a digital context. Thus, it is a "non-digital self-management" scenario.

ANTECEDENTS

Antecedents are conditions that must exist prior to the occurrence of the concept. For digital diabetes self-management approaches, key antecedents include.

Diagnosis of diabetes

The individual must have a diabetes diagnosis (type 1 or 2) requiring ongoing management. Without the chronic disease context, there is no basis for the concept.⁵

Patient readiness and motivation

The patient must have at least minimal health literacy and motivation to engage. This includes willingness to learn about the disease and use technology. Similar analyses emphasize that readiness (including knowledge and developmental stage) is a precursor to assuming self-care responsibility.⁵

Access to digital infrastructure

The patient needs access to relevant technologies (smartphone, internet connectivity, devices) and sufficient digital literacy to use them. Ban et al noted that access to technology is an antecedent for digital health literacy; analogously, access is essential here. Lack of internet or devices would prevent the digital approach.

Supportive environment and provider encouragement

The healthcare system or provider must support use of digital tools (e.g., by recommending an app or enabling telehealth). If providers do not introduce or endorse digital management, patients may not attempt it.

Establishment of self-care responsibility

The patient should have some level of personal responsibility for their care (e.g., an adult managing their own medications). For instance, concept analyses in adolescents emphasize that assuming responsibility is preceded by expectations and parental support in adults, having a culture or expectation of self-care enables digital self-management.⁶ In summary, antecedents combine the presence of a diabetes care need, patient capability and motivation and technological opportunity.

CONSEQUENCES

Consequences are outcomes that result from the concept. When a self-management approach in digital healthcare is successfully implemented, potential consequences include^{5,16-18}

Improved clinical outcomes

Enhanced glycemic control (lower HbA1c) is a primary expected benefit. Studies of digital interventions report significant HbA1c reductions compared to usual care.

Consistent self-monitoring and timely adjustments lead to fewer hyperglycemic episodes. Relatedly, participants in structured self-management programs typically experience better overall health and quality of life.

Increased patient empowerment and self-efficacy

By actively managing data and using feedback, patients feel more confident in handling their illness. They report greater sense of control and knowledge about diabetes. This empowerment is often cited as a mechanism linking self-management to improved outcomes.

Enhanced adherence and engagement

The use of reminders, coaching and feedback tends to increase adherence to medication regimens, diet and exercise plans. Digital interventions often demonstrate higher engagement levels; when properly implemented, they can overcome barriers of forgetfulness or isolation.

Efficiency and cost-effectiveness

There is evidence (e.g., from the HeLP-Diabetes program) that digital self-management support can be cost-effective, potentially reducing healthcare utilization (fewer emergency visits) by improving control.

Broader adoption of digital health

Another consequence is cultural: as Alaslami et al note, even though clinicians and patients may initially hesitate, use of diabetes self-management apps could become the “new normal,” especially post-pandemic. Widespread use of these approaches may increase over time. In contrast, failure to engage in digital self-management can lead to poor outcomes (persistent hyperglycemia, complications). Thus, the concept’s positive consequences are aligned with the goals of diabetes care: better clinical control, patient satisfaction and streamlined services.

EMPIRICAL REFERENCES

Empirical referents are concrete measures or indicators that demonstrate the existence of the concept or its attribute. For self-management in digital healthcare, possible empirical referents include:

Technology usage metrics

Quantitative data such as number of app logins, frequency of blood glucose entries into a digital platform or minutes of telehealth consultation. These objective measures reflect patient engagement with the digital tools (attributes: use of technology, engagement).

Self-management behavior scales

Validated questionnaires that assess diabetes self-care behaviors (diet, exercise, monitoring). Examples include the Diabetes Self-Management Questionnaire (DSMQ) or

Summary of Diabetes Self-Care Activities (SDSCA). Higher scores on such scales indicate active management (attributes: goal-directed action, empowerment).

Clinical outcomes

While not direct measures of behavior, outcomes like glycemic control (HbA1c levels), weight or blood pressure can serve as proxy indicators of effective self-management. Improvement in these clinical metrics suggests successful concept implementation.

Patient-reported empowerment or self-efficacy

Surveys measuring the patient's perceived self-efficacy or empowerment in diabetes care (e.g., Diabetes Empowerment Scale) provide evidence that the approach has enhanced patient confidence (attribute: empowerment).

Health system data

Reduced hospital admissions for diabetes complications or lower utilization of acute care services may indirectly reflect effective self-management adoption at a population level. In practice, researchers could monitor an intervention by tracking both usage analytics (technology logs) and patient surveys (self-care behavior, satisfaction), then correlating with health outcomes. These empirical referents anchor the concept to observable phenomena and guide future measurement.^{3,4,18-20}

DISCUSSION

This concept analysis has clarified the meaning of self-management approaches for diabetic patients in digital healthcare. By delineating its attributes, antecedents, consequences and referents, we offer a precise conceptualization that can inform both research and practice. Unlike more general notions of self-care, our concept explicitly incorporates the role of technology as an enabling context.^{1,15,17,19} The defining attributes highlight that effective self-management in the digital era is not passive it requires active patient engagement empowered by data and connectivity.^{8,9,11,20}

Implications for research

The identified attributes can guide future studies. Researchers developing digital interventions should ensure features that foster each attribute (e.g., tools for goal-setting and feedback for personalization, communication channels for connectivity). Measurement tools can be designed or selected to capture these attributes. For instance, outcome studies might include patient engagement metrics and empowerment scales alongside clinical endpoints. The concept analysis also suggests directions for theory development: one could investigate how digital empowerment mediates the

impact of self-management on outcomes. Furthermore, empirical testing of the antecedents (e.g., does improving digital literacy increase uptake) could refine implementation strategies. By providing a clear definition, this analysis facilitates standardized terminology in research on digital diabetes care.

Implications for practice

Clinicians and educators can use these insights to structure digital self-management programs. Training should emphasize the patient's active role and ensure that the technology chosen truly supports empowerment (rather than just passive information delivery). For example, apps should include interactive features (data entry, feedback, reminders), not just static content. Providers should assess and bolster patients' readiness and digital access, addressing antecedents (e.g., offering device training or alternative tech solutions). Recognizing the core attributes also helps in patient education: for instance, motivating patients by explaining how self-monitoring data can directly guide their daily decisions. Integrating these approaches into routine care (e.g., prescribing an app as part of a care plan) can improve adherence. If patients and providers see digital self-management as a collaborative "approach" rather than a burdensome task, uptake may rise.

Concept analysis is interpretive and relies on the authors' synthesis of literature. There may be other relevant attributes or consequences not captured here. We did not formally evaluate every digital intervention, so unknown factors (such as socioeconomic barriers) might also shape the concept. Additionally, digital health evolves rapidly; new technologies (like AI coaching) may add future dimensions. However, by focusing on fundamental characteristics, this analysis should remain robust as the field advances.

CONCLUSION

In conclusion, our concept analysis suggests that a self-management approach in the digital healthcare context for diabetes is characterized by empowered, tech-enabled patient engagement. This framework can help in designing digital interventions that are truly patient-centered and evidence-based. Future work should operationalize and validate this conceptual model, ultimately improving diabetes care in the digital age.

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